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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/617,590	07/18/2000	Sha Ye		8637

7590

03/27/2007

SHA YE
1721 VIA LUGANO
SAN JOSE, CA 95120

EXAMINER

BUCHANAN, CHRISTOPHER R

ART UNIT

PAPER NUMBER

3627

DATE MAILED: 03/27/2007

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 720 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 720 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.



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NOTICE OF ALLOWANCE AND FEE(S) DUE

7590

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09/617,590

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Sha Ye

8637

TITLE OF INVENTION: RATING BILLING EVENTS IN REAL TIME ACCORDING TO ACCOUNT USAGE INFORMATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1400	\$0	\$0	\$1400	06/27/2007

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

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**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

7590 03/27/2007

SHA YE
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Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/617,590	07/18/2000	Sha Ye		8637

TITLE OF INVENTION: RATING BILLING EVENTS IN REAL TIME ACCORDING TO ACCOUNT USAGE INFORMATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1400	\$0	\$0	\$1400	06/27/2007

EXAMINER	ART UNIT	CLASS-SUBCLASS
BUCHANAN, CHRISTOPHER R	3627	705-030000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a **Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY AND STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
- ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Notice of Allowability

Application No.

09/617,590

Examiner

Christopher R. Buchanan

Applicant(s)

YE ET AL.

Art Unit

3627

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed November 21, 2006.
2. ☒ The allowed claim(s) is/are 3-6 and 9-36.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Allowable Subject Matter

1. Claims 3-6 and 9-36 are allowed.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance:

The prior art, Hanagan et al. (US 2001/0056362), teaches a computer implemented method and system embodied in a computer readable medium for rating a billing event in a real time accounting system with the steps of receiving a billing event for an account (via customer billing manager 18), retrieving current usage information for the account (event rater and pricer ERP 16), and rating the billing event upon receiving the event, according to the billing event, the current usage information, and a usage dependent rating scheme (as disclosed in box 0079).

Regarding claim 5, Hanagan lacks the teaching of determining a current tier reservoir that is a distance to a next step point on a rating curve, comparing the event quantity to the current tier reservoir, and if the event quantity is less than the tier reservoir, adjusting an account balance responsive to the current tier and the event quantity. Regarding claim 6, Hanagan lacks the teaching of determining a current tier reservoir and if the event quantity is not less than the tier reservoir performing: calculating a portion cost for a portion of the event quantity equal to the current tier reservoir, adjusting an account balance by the portion cost, adjusting the remaining event quantity by the current tier reservoir; incrementing the current tier, setting the

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current tier reservoir to be a distance to a next step point from the incremented current tier, repeating said steps of calculating, adjusting the account balance, adjusting the remaining event quantity, incrementing and setting until the event quantity is less than the tier reservoir, then performing: calculating a final portion cost of the remaining event quantity responsive to the current tier, and adjusting the account balance by the final portion cost.

The limitations lacking in the prior art, in combination with the other limitations clearly claimed for patent, are novel and unobvious.

The foreign prior art, Haferd (EP 0063402 A1), teaches a method for real-time metering of electricity usage by consumers, wherein a real-time clock and data output means are used for computing and outputting revenue metering quantities.

Regarding claim 5, Haferd lacks the teaching of determining a current tier reservoir that is a distance to a next step point on a rating curve, comparing the event quantity to the current tier reservoir, and if the event quantity is less than the tier reservoir, adjusting an account balance responsive to the current tier and the event quantity. Regarding claim 6, Haferd lacks the teaching of determining a current tier reservoir and if the event quantity is not less than the tier reservoir performing: calculating a portion cost for a portion of the event quantity equal to the current tier reservoir, adjusting an account balance by the portion cost, adjusting the remaining event quantity by the current tier reservoir; incrementing the current tier, setting the current tier reservoir to be a distance to a next step point from the incremented current

Art Unit: 3627

tier, repeating said steps of calculating, adjusting the account balance, adjusting the remaining event quantity, incrementing and setting until the event quantity is less than the tier reservoir, then performing: calculating a final portion cost of the remaining event quantity responsive to the current tier, and adjusting the account balance by the final portion cost.

The limitations lacking in the prior art, in combination with the other limitations clearly claimed for patent, are novel and unobvious.

The non-patent literature, Syverson, *Industrial Maintenance and Plant Operation* article, discloses a system for determining charges for electricity distribution that provides on-line customer access to real-time product availability and customer specific pricing.

Regarding claim 5, the non-patent literature lacks the teaching of determining a current tier reservoir that is a distance to a next step point on a rating curve, comparing the event quantity to the current tier reservoir, and if the event quantity is less than the tier reservoir, adjusting an account balance responsive to the current tier and the event quantity. Regarding claim 6, non-patent literature lacks the teaching of determining a current tier reservoir and if the event quantity is not less than the tier reservoir performing: calculating a portion cost for a portion of the event quantity equal to the current tier reservoir, adjusting an account balance by the portion cost, adjusting the remaining event quantity by the current tier reservoir; incrementing the current tier, setting the current tier reservoir to be a distance to a next step point from the

Art Unit: 3627

incremented current tier, repeating said steps of calculating, adjusting the account balance, adjusting the remaining event quantity, incrementing and setting until the event quantity is less than the tier reservoir, then performing: calculating a final portion cost of the remaining event quantity responsive to the current tier, and adjusting the account balance by the final portion cost.

The limitations lacking in the prior art, in combination with the other limitations clearly claimed for patent, are novel and unobvious.

Conclusion

3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Buchanan whose telephone number is 571-272-8134. The examiner can normally be reached on Mon.-Fri. 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ryan Zeender can be reached on 571-272-6790. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3627

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CB

 3/9/02
F. RYAN ZEENDER
SUPERVISORY PATENT EXAMINER

Notice of References Cited	Application/Control No. 09/617,590	Applicant(s)/Patent Under Reexamination YE ET AL.	
	Examiner Christopher R. Buchanan	Art Unit 3627	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	EP 0063402 A1	07-1982	GB	Haferd	G01R 21/00
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Syverson, Nancy, "Inside Graybar, a Profile of the Nations's Top Electrical Distributor", Industrial Maintenance and Plant Operation, Vol. 61, No. 11, p. 14, November 2000.
	V	Davis, Charles, "Online financing to boost procurement", Electronic Payment International, p. 14, February 2000.
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

12

EUROPEAN PATENT APPLICATION

21 Application number: 82300058.3

51 Int. Cl.³: G 01 R 21/00

22 Date of filing: 07.01.82

30 Priority: 21.04.81 US 256073

43 Date of publication of application:
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54 Designated Contracting States:
 AT BE CH DE FR GB IT LI LU NL SE

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54 Multi-function electricity billing meter.

57 A multi-function electricity revenue meter is disclosed which converts instantaneous currents and voltages for each phase to digital form by sampling appropriately stepped down analog signals. The current and voltage digital sample signals provide the basic data from which a multiplicity of other revenue metering quantities are computed. The meter uses a plurality of voltage and current transformers for reducing or providing signals proportional to the instantaneous voltages and currents. These analog signals are applied to an analog to digital converter which provides outputs representing the instantaneous values of the voltages and currents of the phases of the power system. A central processing unit is connected to the analog to digital converter as well as appropriate RAM and ROM memory, a real-time clock/calendar and suitable data output means for computing and outputting the electricity revenue metering quantities.

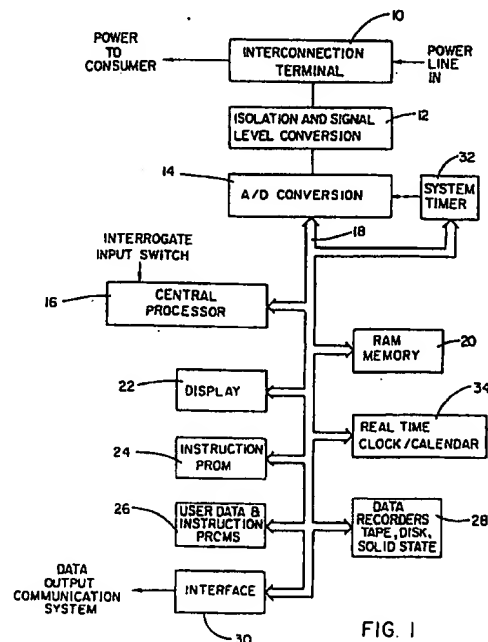


FIG. 1

EP 0 063 402 A1

MULTI-FUNCTION ELECTRICITY BILLING METERTechnical Field

5 This invention relates to electricity metering and more particularly relates to a solid state electricity revenue meter which generates a multiplicity of different functions or quantities which are useful in determining the cost of the electrical energy supplied to a customer.

10

Background Art

 In the electrical energy industry the various quantitative measurements which determine customer billing are traditionally
15 obtained from a variety of different devices. Each device is designed and constructed to meter a particular quantity. For example, the historic Ferraris rotating meter is used in a variety of forms to measure real energy or reactive energy (KVAR) and with uniquely designed attachments, to measure related power demand
20 quantities. Kw and KVAR transducers when coupled with appropriate integrating means are also used for these purposes. Inherent in the electromechanical structure or electronic circuitry of each such device are the mathematical operations which are necessary to determine the particular quantity.

25

 For example, the rotating Ferraris meter inherently provides a cumulative total number of output revolutions which is proportional to the product of current, voltage, the cosine of the angle between
30 them and time in hours. Similarly, a KVAR transducer provides an output which is proportional to the product of voltage, current and the sine of the angle between them.

 With conventional technology a power company orders and installs those devices or transducers which provide the quantities
35 which are desired. Some manufacturers have combined more than one type of transducer into an aggregation of such devices in a single piece of equipment which may also have additional features.

Patent 4,218,737 shows two different transducers combined in a circuit which converts each of their outputs to digital form and then processes, stores, communicates and displays the processed data.

5

Brief Disclosure of the Invention

This invention has no transducer or device which directly generates any of the functions or quantities which are used for billing purposes. Instead, the present invention provides electronic solid state circuitry which samples the basic analog quantities of instantaneous current and instantaneous voltage as they appear in the power distribution system at some interconnection terminal, such as between a power line and the energy consuming equipment of the customer. Those current and voltage samples are converted directly to digital form. Data signals representing the voltage and the current samples are then processed by a data processing unit to provide the desired quantities, such as for example total kilowatt hours, peak kilowatt demand, total kilovar hours, average kilovars, peak KVA demand, total KVA hours, kilowatt and KVA demand peak average, power factor average, power factor at demand peak, total KQh, etc.

One advantage of the invention is that a single meter can be installed to obtain numerous revenue related readings where several conventional meters and attachments have otherwise traditionally been required. The computing portion of a meter embodying the invention may be provided with interchangeable or replaceable ROMs which contain data representing the current rate structure for a particular company and a specific customer.

The circuitry of the present invention permits a unit to be constructed which meters all the quantities which are desired for revenue billing purposes with a single unit which is physically and electrically compatible with conventional Ferraris meters so that a meter embodying the invention may directly replace one or more traditional Ferraris meters without requiring any other modification of the customer's preexisting installation.

Brief Description of the Drawings.

Fig. 1 is a block diagram illustrating the preferred embodiment of the invention.

5 Fig. 2 is an oscillogram illustrating the sampling technique used in the operation of the preferred embodiment.

Fig. 3 is a table of equations illustrating the data processing which is used to convert the voltage and current samples to some of the most commonly used metering quantities.

10 In describing the preferred embodiment of the invention which is illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, it is not intended that the invention be limited to the specific terms so
15 selected and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose. For example, the word connected or terms similar thereto are often used. They are
20 not limited to direct connection but include connection through other circuit elements where such connection is recognized as being equivalent by those skilled in the art.

Detailed Description of the Best Mode

25 Referring to Fig. 1, electrical power from a distribution system is provided to some interconnection terminal 10 and from the interconnection terminal 10 is supplied to the energy consuming equipment of the customer. While interconnection
terminal 10 may be either custom designed or a conventional type,
30 usually it is either an S-type mounting for socket connection to a Ferraris-type meter or an A-type mounting for direct connection of the line and the load conductors.

An isolation and signal level conversion means 12 has its
35 input connected to the interconnection terminal 10 and provides at its output a plurality of analog signals which are proportional to the instantaneous voltage and current of the

phases of the power line. Preferably, these are conventional transformers which provide isolation and reduce the voltage and current signals to a workable level which is compatible with solid state circuitry.

5

The present invention will operate with single and multi-phase power distribution systems. In a single phase system there will be one or two current transformers and one or two voltage transformers. However, for a conventional three-phase system, the isolation and signal level conversion means 12 will consist of two or three voltage stepdown transformers and two or three current transformers. Therefore, in the three-phase system the output of the isolation and signal level conversion means will consist of two or three output current signals which are proportional to the instantaneous currents of the power distribution system at the interconnection terminal 10 and two or three voltage signals which are proportional to the three voltages of the three-phase system at the interconnection terminal 10.

20

The output of the isolation and signal level conversion means 12 is applied to an analog to digital converter or A/D conversion means 14. The analog to digital conversion means 14 is controlled by a central processing unit 16. The A/D conversion means 14 converts the analog signals which are applied to its input, such as the three current and three instantaneous voltage signals for a three-phase system to digital data signals representing instantaneous values of the voltages and of the currents for the three phases.

30

Thus, for example, the output of the A/D conversion means 14 for a three phase system might consist of three current and three voltage data words which are applied to the data portion of a data, address and control bus 18 in accordance with conventional data processing design principles.

35

The central processing unit 16 is also connected through the bus 18 to a RAM memory 20, a display 22, a programmable read-only memory or PROM 24 and a second PROM 26.

5 Two PROMs 24 and 26 are used so that the PROM 24 may be permanently installed and contains instructions and data which are common to usage of the multi-function revenue meter by all users. The PROM 26, however, is replaceable and contains instructions and data for a particular installation.

10 The bus 18 is also connected to data recording mechanisms such as tapes, discs, and solid state memories which may be referred to as a data recorder 28 and to conventional interfacing circuitry 30 to permit transmission of the data
15 through a communication system.

A system timer 32 is connected to the bus 18 and may be connected to the A/D conversion means 14 depending upon the type of A/D converter used. A real-time calendar/clock 34
20 is also connected to the bus 18 and is needed for computing the time based quantities.

The manner of connecting a central processor through a bus to associated RAM and ROM memories, output devices and the
25 other described elements is well known to those skilled in the art and therefore is not disclosed in further detail.

Similarly since a variety of A/D conversion means have been described in the prior art, the particular circuit used in the
30 present invention is not described in detail. However, it is preferred that the digital conversion means 14 be of the sample and hold type. Preferably a plurality of angularly spaced samples are taken at different angular positions along the approximately sinusoidal signals representing the voltages and current described
35 above. Each voltage sample is taken simultaneously with an associated current sample so that the samples are obtained as simultaneous pairs. In a three phase system the samples are taken as three simultaneous sets of simultaneous i and v pairs.

Fig. 2 illustrates a typical, approximately sinusoidal, instantaneous current or voltage signal 40. It is preferred that eight samples of the signal be taken for each cycle of the 50Hz or 60Hz power signal. The samples are specifically, angularly spaced along the cycle. Subsequent sample sets may not be angularly coincident with the preceding sample sets but will also be specifically angularly spaced along the cycle. Preferably the samples are uniformly angularly spaced.

However, since one cycle of 60Hz power has a period of approximately 17 milliseconds, all eight samples are not taken during the same cycle. Because the signal is periodic, the samples can be taken during subsequent, representative repetitive cycles at specific, angularly spaced positions in the cycle.

For example, the first sample may be taken at 45° following the positive-going zero crossover of one cycle. The second sample might be taken 90° after the positive-going zero crossover of the first subsequent cycle and the third sample taken 135° after the positive-going zero crossover of the second subsequent cycle and so forth and so on. In this manner the samples are taken at an integral number of phase angles which are specifically angularly spaced along representative repetitive cycles of each of the current and voltage analog signals from the amplitude reduction means 12.

For each of the samples, for example the eight samples, representing a sample set, illustrated in Fig. 2, a digital data word is provided at the output of the A/D conversion means 14. Thus, in a three phase system 48 such data words will be utilized to represent the voltage and current samples for the three phases.

The table of Fig. 3 illustrates how these samples are processed by the central processing unit 16 for computing some of the more common quantities used in revenue metering.

For example, real energy may be computed for the time interval over which the sample is taken. It is computed for each

phase by summing the products of each voltage sample and its simultaneously taken current sample for all of the eight sample positions then dividing that sum by the number of samples, such as eight. This is done for each phase and then the three results are summed. The computed increment of real energy is then stored in memory along with data representing the time at which the quantity was determined. The same computing techniques may be applied to the other conventional revenue metering quantities for which there are standard definitions and algebraic statements well known to those skilled in the art.

Similarly, the mathematical statements defining other quantities and algorithms based on rate structure may be implemented by the processor and its associated memories and the date may be displayed and/or communicated as desired

It is to be understood that while the detailed drawings and specific examples given describe preferred embodiments of the invention, they are for the purposes of illustration only, that the apparatus of the invention is not limited to the precise details and conditions disclosed and that various changes may be made therein without departing from the spirit of the invention which is defined by the following claims.

CLAIMS

1. An electricity billing meter for connection to the inter-connection terminals between either a power line and the energy consuming equipment of a customer, or two power lines at their junction at an interchange tie point, said meter comprising:
- (a) an isolation and signal level conversion means having its inputs connected to said interconnection terminal for providing, at its outputs, a plurality of analog signals which are proportional to the instantaneous voltages and are proportional to the instantaneous currents of the phases of said power line;
 - (b) analog to digital conversion means having its input connected to the output of said isolation and signal level conversion means for providing, at its output, digital data signals representing instantaneous values of the voltage and of the current for the phases of said power line;
 - (c) a central processing unit connected to a data, address and control bus which is connected to the output of said A/D conversion means for controlling and receiving data signals from said A/D conversion means and for processing said data signals;
 - (d) memory means including RAM and ROM data storage means connected to said bus;
 - (e) real-time clock means connected to said bus; and
 - (f) data output means connected to said bus for outputting data resulting from the processing of data from said A/D conversion means.
2. A billing meter in accordance with claim 1 wherein said analog to digital conversion means is connected to said system timer and is a sample and hold type of A/D conversion means.
3. A billing meter in accordance with claim 1 wherein said memory means includes at least one main program storage PROM and a physically separate user data and special instruction PROM.
4. A billing meter in accordance with claim 1 wherein said data

output means includes a visual display and an interface means for providing data output in serial form.

5. A billing meter in accordance with claim 1 wherein said analog
5 to digital conversion means is connected to said system timer and
is a sample and hold type of A/D conversion means; wherein said
memory means includes at least one main program storage PROM
and a physically separate user data and special instruction PROM;
and wherein said data output means includes a visual display
10 and an interface means for providing data output in serial form.

6. A method for metering electrical parameters at a point in an
electrical power transmission system, said method comprising:
15 (a) sampling and converting to a digital signal an analog
signal which is proportional to the instantaneous voltage
of each phase of said transmission system at said point
in said transmission system;
(b) sampling and converting to a digital signal an analog
20 signal which is proportional to the instantaneous current
for the phases of said transmission system, said sampling
of said voltage and current signals being performed
substantially simultaneously;
(c) storing said digital sample signals; and
(d) arithmetically processing said stored signals to
25 generate digital signals representing at least one of said
parameters.

7. A method in accordance with claim 6 wherein said samples
are taken at an integral number of phase angles uniformly
30 angularly spaced along representative repetitive cycles
of each of said analog signals.

8. A method in accordance with claim 7 wherein said processing
includes metering real energy during a time interval by summing
35 for each phase the product of said integral number of instantaneous
digital voltage and current signals for each pair of simultaneous
current and voltage signals, averaging said sum over said number
of samples and adding said sums for each phase.

9. A method for electricity distribution system metering comprising:

(a) periodically sampling voltages and currents of said system at each of a plurality of sample positions which are angularly spaced along a composite cycle of said electricity to provide a group of samples;

(b) converting said group of voltage and current samples to digital data form; and

(c) machine computing selected electricity metering quantities from said digital samples for each of said periods.

10. A method in accordance with claim 9 wherein some of said computed quantities for each sampling period are cumulatively summed.

11. A method in accordance with claim 10 wherein the sample positions for each of said group of samples are uniformly angularly spaced along said composite cycle.

1 / 2

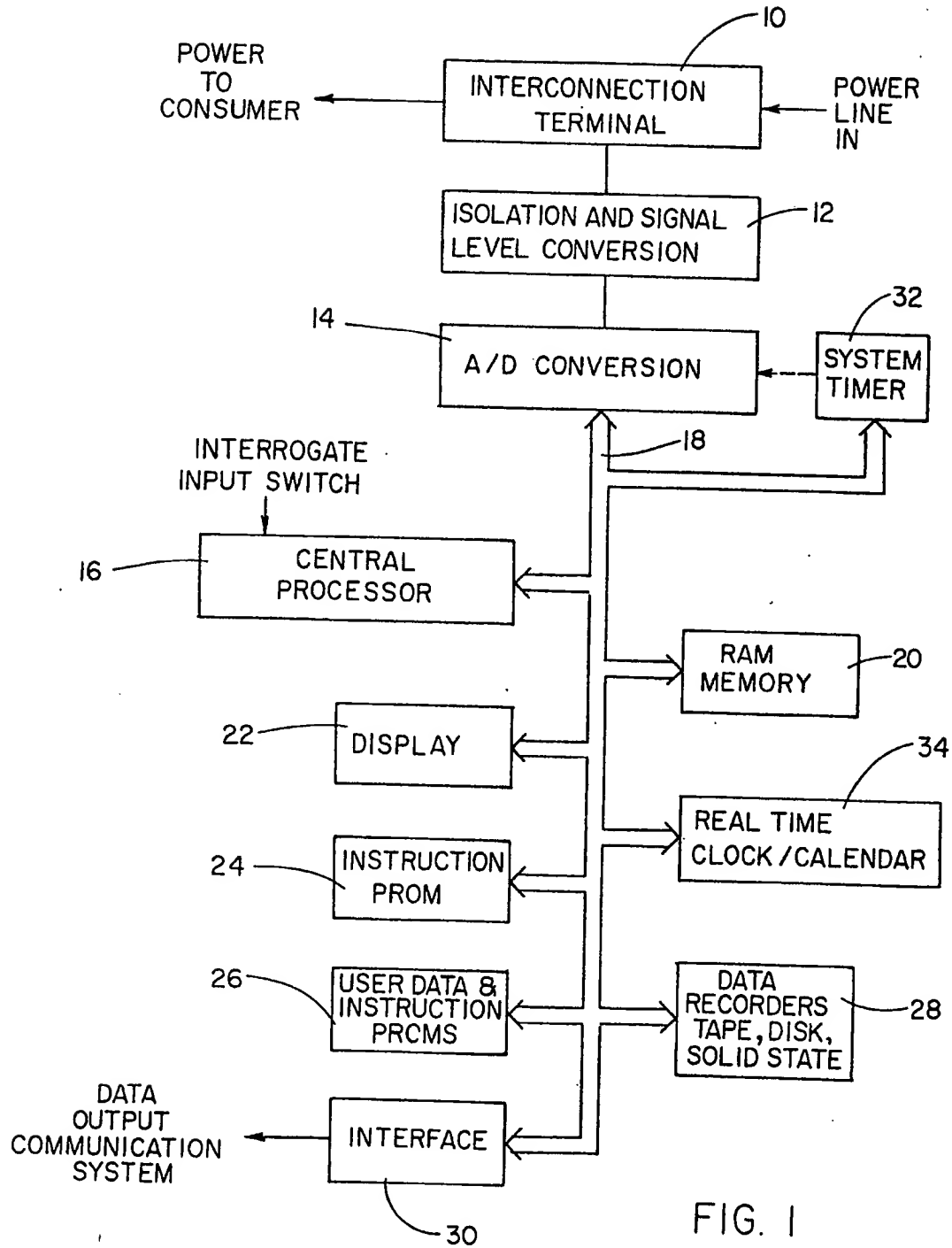
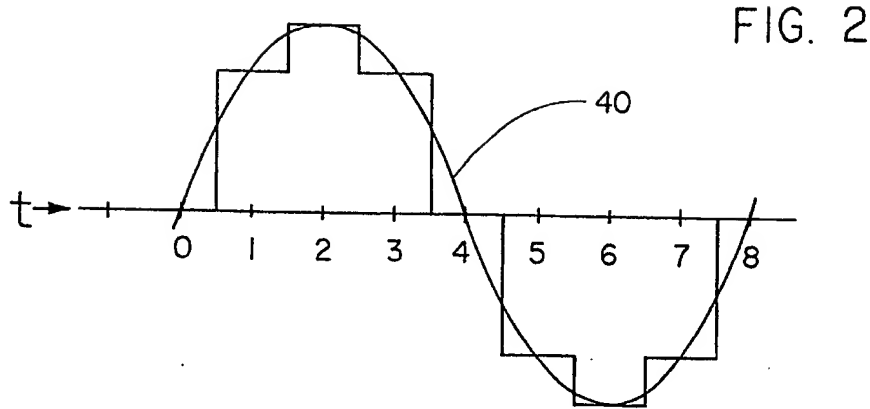


FIG. 1



$$\text{REAL POWER} = P = \sum_{\phi=a}^c \left(\frac{1}{8} \sum_{t=0}^7 e_{\phi,t} i_{\phi,t} \right)$$

FIG. 3

$$\begin{aligned} \text{MAGNITUDE OF REACTIVE POWER} &= |\text{VAR}| \\ &= \sqrt{V^2 A^2 - P^2} \end{aligned}$$

$$\text{WHERE: } V = \sum_{\phi=a}^c \sqrt{\frac{1}{8} \sum_{t=0}^7 u_{\phi,t}^2} \quad A = \sum_{\phi=a}^c \sqrt{\frac{1}{8} \sum_{t=0}^7 i_{\phi,t}^2}$$

$$\text{SIGN OF REACTIVE POWER} = \text{SIGN OF } (P_+ - P_-)$$

$$\text{WHERE: } P_+ = \sum_{\phi=a}^c \left(\frac{1}{8} \sum_{t=0}^7 e_{\phi,t} i_{\phi,t+1} \right)$$

$$P_- = \sum_{\phi=a}^c \left(\frac{1}{8} \sum_{t=0}^7 e_{\phi,t} i_{\phi,t-1} \right)$$

$$\text{POWER FACTOR} = \frac{P}{VA}$$

ϕ = DIFFERENT PHASES

EG. a, b, c FOR 3 PHASE



European Patent
Office

EUROPEAN SEARCH REPORT

0063402

Application number

EP 82 30 0058

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	US-A-4 077 061 (JOHNSTON et al.) *Column 6, line 24 - column 8, line 30; column 11, lines 54-65; figure 1*	1-6	G 01 R 21/00
Y	EP-A-0 014 038 (SOUTH EASTERN ELECTRICITY BOARD) *Claim 1*	7-11	
Y	FR-A-2 449 285 (LEEDS & NORTHROP) *Claim 1*	7-11	
D,A	US-A-4 218 737 (BUSCHER et al.) *Abstract; figure 1*		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			G 01 R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13-07-1982	Examiner KORAHNKE G.J.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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side Graybar A Profile of the Nation's Top Electrical Distributor

Graybar Electric Co is profiled; it dominates the \$67 bil electrical distribution market, with sales of \$4.3 bil in 1999)
Industrial Maintenance & Plant Operation , Volume: 61 , Number: 11 , Page: 14 , November 2000

Nancy Syverson , Managing Editor

With an industry-leading \$4.3 billion in sales, Graybar is at the top of its game. Here's how the 130-year-old, publicity-shy giant does it. Electrical distribution is a \$67 billion industry in the United States. Analysts consider it "large, growing, highly segmented and competitive." The market is dominated by four national chains: Graybar Electric Co., St. Louis, MO; WESCO Inc., Pittsburgh, PA (originally the distribution arm of Westinghouse Electric Corp.); GE Supply (General Electric Co.), Shelton, CT; and Consolidated Electrical Distributors, Inc., Westlake Village, CA. Leading the list of the Top 250 electrical distributors (ranked by Electrical Wholesaling magazine) is Graybar Electric Co., with 1999 sales of \$4.3 billion.

Historically, Graybar was the distribution arm of the Western Electric Co., which was spun off in 1926 and then bought by its employees in 1929. Graybar was named for Elisha Gray, an inventor, and Enos Barton, an entrepreneur who founded the partnership in 1869 that became Western Electric in 1872. (See "Graybar: A Name With Deep Roots in Industry," page 15.) The company's rich tradition and long history of service are highlighted by its direct involvement with the growth of the telegraph industry and the invention of the telephone. While Graybar has always been a strong company, recent growth has been exceptional by distribution-industry standards. The past five years have yielded sales growth at an average annual compounded rate of more than 12%. In 1995, Carl Hall, a 40-year Graybar veteran, was named chairman, president and CEO. Under Hall, the company's business model was split into two specialized businesses: comm/data and electrical sales. Hall also stepped up company-wide training, which includes required courses for key positions at Graybar. The company intranet supports a virtual campus, which is supplemented by instructor-led classes and manufactured-sponsored training. Hall also recognized the importance of maintaining a strong customer focus and elevated the company's distribution philosophy to market entry deployment and customer service the third leg of his strategic plan. For health reasons, Hall stepped down as president and CEO in July 2000, but retained the title of chairman. Robert Reynolds, Jr., a 28-year, second-generation Graybar veteran, succeeds him as president and chief executive officer. (Editor's Note: This story was prepared prior to the appointments noted above. Since that time, Charles Udell was promoted to Reynold's previous position as senior vice president, electrical business, and Bruce Judkins moved into Udell's position as vice president, electrical marketing.) Graybar is well-positioned geographically to serve customers throughout the U.S. It was moved from its Lexington Ave. location in New York City in 1982 to take advantage of St. Louis' better proximity to all markets. Graybar headquarters occupies four floors of a multi-story corporate building in the St. Louis suburb of Clayton. A separate facility 15 miles west houses the company's information systems department; additional corporate personnel are located at Graybar's St. Louis District headquarters in a separate facility built four years ago. Graybar is actually at the top (based on sales) of some 8,000 electrical distributors in the U.S. Like other distribution sectors, electrical is undergoing unprecedented change due to consolidation, e-business and other factors. In its "Industry Trends" report, the National Association of Electrical Distributors (NAED), St. Louis, has identified these and other factors that shape the industry Graybar leads. They include: Consolidation: A record number of acquisitions took place in 1999, a process that NAED says will continue. The group notes that, increasingly, large customers with multiple sites across multiple states are turning to big distributors with a local presence. Graybar's goal is to be that distributor for electrical products. The trend has encouraged smaller distributors to put their companies up for sale, which has enabled Graybar to aggressively pursue its goal of providing its services through a strong network of local providers. For example, the company has bought five companies just in the past 18 months. The largest, Splane Electric Supply Co., Detroit, MI, was a \$100 million business with 70 employees at six locations. Both Graybar and WESCO include growth-through-acquisition in their strategies. While doing so, they also battle overseas companies like Paris, France-based Sonepar SA and Rexel SA, the largest electrical distributor in the world, who are actively seeking acquisitions in the U.S. to expand their customer base. Market share: According to NAED, the 25 largest electrical distributors represent more than 28% of the market. With revenues ranging from \$229 million to Graybar's \$4.3 billion, this top group increased its market share almost 1 percentage point in 1999, due partly to Consolidated Electric's acquisition of All-Phase Electric Supply Co. Still, no single company has more than 5% of the industry's sales. A little more than half (57%) of all electrical distribution sales are generated by a large number of small companies making less than \$21 million each, annually. Such fragmentation only encourages consolidation, as companies with the greatest purchasing power seek to build market share by regularly acquiring smaller pieces of the pie. Niche markets: Graybar and other electrical distributors are moving into niche markets to broaden their revenue base. New technology

vision's vice president. According to Reynolds, as this market has grown, it has shown a growing preference to use additional distribution methods instead of buying directly from manufacturers. The Web and e-commerce: According to NAED, approximately 45% of electrical distributors now do business on the Internet with their customers; nearly 70% say they use the Internet for product information from suppliers. As an inventory-driven business, electrical distribution has warmed to using the Web as a round-the-clock tool that can provide catalog and pricing information electronically. E-commerce has developed more slowly among electrical distributors, Graybar included. Graybar's Web presence includes an information-only Web site (www.graybar.com), and an e-commerce-enabled site (www.GraybarNet.com) for its existing customer base. Graybar is also active in the Industry Data Warehouse (IDW), a joint project between NAED, NEMA (National Electrical Manufacturers Association), and NEMRA (National Electrical Manufacturers Representatives Association). An electronic warehouse for product information that can be shared by all members of the electrical industry, IDW was designed to provide a foundation for the growth of electronic commerce. Graybar has grown from the 59 nationwide distributing houses it absorbed from Western Electric in 1926 to today's 292 stocking locations worldwide. The company has added 2,500 new employees in the past few years, including 350 additional sales representatives, boosting the company's headcount to a total of 9,700. Part of Western Electric's early success as a distribution business as well as a manufacturer hinged on its realization that it could purchase supplies and sell them to the telephone companies more efficiently than the companies could acquire the supplies themselves. And, based on 1999 data, no one understands the electrical distribution business better than Graybar. "Our mission is to be the best," says Bruce Judkins, vice president/electrical marketing. "We don't necessarily have to be the biggest. To be the best, you have to focus on certain things, certain markets. We try to differentiate ourselves through our business and distribution services. We try to really find out what is the customer's hot button today." According to Judkins, Graybar works with multi-site corporate customers who are seeking the competitive edge in the marketplace through consolidation, integration and standardization of their spend. Analysts say customers expect distributors to offer a broad package of both products and services because they are outsourcing non-core functions now more than ever. Every customer's view of what value-added services they need to realize cost savings in purchasing, inventory and supply chain management is different. "Forty-two customers, 42 hot buttons," says Judkins. Graybar offers its customers an array of distribution services, or a menu of value-added services customized to fit the needs of that customer. Integrated supply, which is one way companies seek to reduce their supplier base, is one of the MRO types of solutions that Graybar offers. Supply-base consolidation and standardization packaged in the form of integrated supply drives down cost, which is a major concern for any company. Judkins notes that the process is in use at widely varying levels. While many companies are just beginning integrated programs, others have been using them for years. Graybar customers familiar with the gains available from integrated programs are sometimes looking for new areas of savings, says Judkins. These can include e-business or supply chain optimization, which focuses the supply chain exclusively on the needs of the customer. "It's still a world of assessing and testing," he says. "The real challenge for any company is to try to anticipate, Where is my customer going? How do I get there? How do I get there before they're there? How do I get in front of the curve, that is, become the company with the competitive advantage?" Graybar takes a classical consultative approach to customer management. The sales organization consists of three tiers: directors, national account managers and branch employees. Each director is responsible for target industries. For example, Jeff Cook, director of national accounts, a 20-year Graybar veteran, includes Bethlehem Steel among his accounts. He knew that Bethlehem, a multi-site producer of fabricated steel, wanted to improve its bottom line by leveraging its spend, consolidation and standardization. The company went from many electrical suppliers down to one: Graybar. "This was a unique opportunity for one company on a national scale to service one customer one way," says Cook. "You win, you win all of their plants for a number of years. So the stakes have gotten pretty high." This 3-tier system provides customer interaction at all levels and the mechanism to manage the customer relationship. Graybar centralizes the information: the directors, account managers and branch people gather on a particular customer, then returns to the customer with suggestions and solutions. To take the solution one step further, Graybar has implementation teams, so the sale does not close with the signing of an agreement or contract. "We're trying to train ourselves to be solution specialists and cost-saving specialists," says Judkins. "When it comes down to it, the customer says, Don't send me your sales person — send me your person who is going to come in and help me save money. We approach the customer through a team process. No one sales representative goes out and tries to win it all on his own." Graybar's corporate strategy is to not to be everything to everyone. Their prototype customer is the wholesale, electrical and comm/data contractor, industrial plant and service provider looking for cost reductions. This type of customer typically has high service expectations. "Customers want more value out of service, more than just the product we are selling," says Ed Keith, vice president of logistics. "They want complete orders, they want orders to be accurate and they want them to be at a low cost." And they want their products delivered fast. Graybar saw a significant increase in warehouse volume between 1996 and 1999. This increase, combined with changing distribution channels and customer requirements, placed new demands on the company. "There's this constant compression on margin and cost," says Keith. "The customer wants to pay less, but they want all these value services too. The distributor that can provide it value at the lowest cost will be the one that survives." Graybar looked at various types of wholesalers and compared net operating expenses as a percentage of sales and examined each business model. The company concluded that the lowest-cost and highest-value distributors had sophisticated distribution and transportation networks, including integrated distribution

customer purchases, known as a "demand-pull" strategy. It has built nine of 16 new "zone" warehouses to supply its customer branch network faster and more efficiently. These zone warehouses are strategically situated to enable 24-hour delivery service. So customer orders received today will be delivered the next day, usually before noon. "If you run a distribution company in the United States with a distribution network of four or five (locations), you could cover the whole United States in 48 hours," claims Keith. "But to condense that down to 24-hour delivery time, you need more distribution centers. That's why we have so many." Graybar opened its ninth zone warehouse in Rogers, MN, during the summer of 2000. This new, 4,000-sq.-ft. facility is equipped with a state-of-the-art warehouse management system (WMS) and includes a 3,000-sq.-ft. office and 14 dock doors. It operates from 4 a.m. to 9 p.m., Monday through Friday, with a staff of 40 employees. The Rogers operation was built from the start with the company's service strategy in mind. It is semi-automated, semi-mechanical, supported by state-of-the-art putaway and picking techniques, labeling, scanning, lifts and other vehicles like the Bendi, a skidlift with a front-end that makes complete, 90-degree turns to the left and right. The Rogers WMS uses Provia software that interprets bar-coding scanned in by a radio frequency terminal (RFT). All orders are entered locally but are processed through the company network to the on-site WMS server where they are downloaded to hand-held scanners for picking. Like many Graybar executives, Charles Udell, senior vice president, electrical business, began his career in the warehouse. "Our group is involved in marketing, and since marketing consists of product, place, price and promotion, as a distributor, the first focus is product because that is what you take to market," he says. He adds that, through market studies, Graybar can determine the type of products required and preferred brands based on application. "At first blush what attracts a customer to a distributor is what is satisfied by a product," adds Udell. "The most significant thing the marketing group does is to conduct a product selection to assure the customer that we can supply the product." This "supplier selectivity" approach, implemented in 1990, was made possible through the company's mainframe computer system. The Graybar electrical business alone handles 10 million SKUs or more. For a long time, Udell says there was no way to centralize and analyze data on what customers were buying, how much and from whom. Graybar invested into computers in the late 1980s, installing the mainframe and creating a database that stores all transactional data, regardless of where the transaction took place. "That's when the sleeping giant awoke," says Udell. "We developed a specific group of suppliers with specific customers. Then we trained our sales representatives on each line. Next, because we were buying the same item everywhere, we were able to build a logistics infrastructure, and that's when the zone warehouse strategy began." The product is positioned in the logistics network so the customer has product availability from the zone within 24 hours, or from the nearest Graybar branch, which ensures same-day delivery. Udell says Graybar can't always offer the lowest price, but the prices it does offer are competitive and provide the best value for the customer. Lastly, and probably most importantly, the last "P" for promotion is the Graybar sales rep. "There are more Graybar sales reps on the street than ever before," says Udell. "The sales rep is promoting our value proposition. That's where we put most of our promotional energies and dollars." Graybar has been involved in electronic commerce for many years, starting over a decade ago with one of the first implementations of the computer-to-computer ordering system called Electronic Data Interchange (EDI). Graybar has continued to add to its e-business capabilities, including customer-specific B2B integration processes, EFT, supplier-specific B2B integration processes, and its Internet-based sales portal, GraybarNet. GraybarNet provides a procurement solution for Graybar's current customers of record. Customers can access the system to browse the electronic catalog, select items for purchase, and receive real-time availability of products along with customer-specific pricing. In addition, customers can check order status on any order in Graybar's system regardless of the method of entry (the Web, customer service representative entry or EDI). All orders completed within GraybarNet are processed in Graybar's ERP system within minutes. The acceleration of e-procurement and use of the Internet over the last 12 months alone has prompted Graybar to seriously analyze its e-business position. "Rather than building something we think is right, we are working with our customers to determine what they think is right," says Deb Weis, Graybar's director of e-commerce. "Our E-business initiative will be driven by what the customer requires." According to Weis, one of the primary initiatives at Graybar today is the redesign of the company's Internet presence. The current GraybarNet system is a fully customized solution running on a platform designed to provide a point solution. In today's environment, flexibility to adapt to supply chain shifts is paramount. To accomplish this, the company is working on an e-business platform that will allow for shifts without rendering large portions of its Internet offering obsolete, says Weis. The first application released on this platform will be an updated version of GraybarNet. All basic functionality will remain the same, she says, with improvement focusing on the user interface, the electronic catalog, and some new features such as credit card processing and quote request. In addition, the new platform will allow for easier integration into existing marketplaces and customer-owned e-procurement systems. "We have built a brand for service that we want to transfer to the Internet with the trust from our customers," says Weis. Another area Graybar will be monitoring is the use of pervasive devices such as Personal Digital Assistant (PDAs) and cell phones, and their use for B2B commerce and communication. Still in its infancy, wireless technology is expected to grow significantly in the next few years. Graybar plans to develop those that can provide efficiency gains to the distribution process. "Think about being able to have a device in your hand to check availability," says Weis, "or request an order to be delivered to a site." According to Web researcher Dan Garretson, senior analyst at Forrester Research, Cambridge, MA, Graybar's emphasis on developing such communication channels is a good move. "The major impact of the Web on distribution is the flow of information," he says. "Whereas information used to flow through the channels sequentially from manufacturer to wholesale distributor to reseller to customer, now, any link in the chain can get information from anywhere else in the chain." In 1999,

Graybar purchased the company for \$9 million. The market crashed soon thereafter, and the employee owners of Graybar were left with the task of seeing the company through the financial crisis that plagued American commerce. During the 1930s, the company merchandised appliances and sewing machines under the Graybar brand name. By 1941, the company had 86 distribution houses and sales had reached \$100 million. Now, says Jeff Cook, "I would say the biggest selling feature for Graybar is our 130-year old tradition. The fact that we are employee-owned is very important to customers because when dealing with employee owners, they know there's a lot of pride and interest." He adds that because the company is privately held, its identity and goals do not have to be compromised by its performance on Wall Street. Most senior officers at Graybar have worked their way up to their executive positions from the warehouse ranks, and every employee is a true owner with a shared responsibility for the company's performance. "Our corporate culture is that we have a true vested interest," stresses Mell. "We invest back into our company with customer-service initiatives. We are taking hold of our future instead of letting someone else take hold of it for us."

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Online financing to boost procurement.

Davis, Charles

Electronic Payments International, Page: 14, Feb 2000

Credit decisions can be processed in real time at the point of sale due to a new online marketplace linking businesses to potential financing partners.

ECREDIT card is a quick and painless method for online customers to establish credit and pay for goods and services. Corporate customers, whose online shopping can involve purchases worth millions of dollars, do not have such an easy option despite the fact that most observers expect the business-to-business market to dominate e-commerce.

After eCredit.com, a Massachusetts-based start-up, and its Global Financing Network (GFN). GFN is an online marketplace that connects businesses to multiple potential financing partners and information sources so that credit decisions can be processed in real time at the point of sale. Its online financing network could usher in the next great phase of e-commerce: online procurement.

Quick, reliable credit has been a major obstacle for the business-to-business e-commerce market-- a market that Forrester Research predicts to be worth \$1.3 trillion by 2002. ECredit addresses this problem, making it easier for companies that do not have years of experience, or top-tier credit ratings, to shop for financing that will close deals, leading to more business-to-business activity.

Web-based commerce makes the need for flexible financing more important, said David Robertson, eCredit vice-president, e-commerce marketing. Business-to-business transactions are met with customer expectations of instant access to product information, ordering and financing. Information must be ready in seconds -- minutes are simply too long in today's light-speed competitive environment.

"Credit, which was once a part of the back office, is now part of the order flow," Robertson said. "You must be able to finance a deal to close the deal."

Thanks to a platform linking multiple lenders to credit-decisioning software, eCredit has been able to take the LendingTree.com aggregated-lender model and extend it to the commercial-lending level. Businesses seeking credit fill out a online application which is e-mailed to a group of participating lenders.

The Global Financing Network (GFN) offers real-time access to global information sources, including credit bureaux, credit insurance links and escrow information.

ECredit also provides real-time automation of trade credit decisions, allowing companies to install parameters for the system to make instant decisions about whether a company can open an account with the seller. Through an agreement with Fair, Isaac, eCredit has incorporated predictive technology such as CrediTable and Small Business Scoring System (SBSS) into the platform.

Fair, Isaac's trusted name in the financial credit industry gives eCredit instant credibility. Its scorecards, widely used in US credit, incorporate empirically derived, pooled data, driving complex credit decisions to resolution in less than a minute. Its SBSS model is the industry's dominant small business lending decision system.

"We see eCredit's technology as a strong platform for deployment of our scoring models in a real-time environment, particularly in support of business-to-business e-commerce and consumer-credit granting," said Latimer Asch, vice-president Fair, Isaac.

After all of this information is accessed, the lenders respond with financing terms and offers to the business, which then agrees with one of the lenders, prints out the paperwork, signs it and faxes it back in a transaction lasting just hours. Commercial-lending transactions done on paper can take days or even weeks.

ch as risk levels, approval rate, auto-decision rate and customer-satisfaction levels.

et Leasing of Troy, Michigan, uses eCredit to automate its complete lease application process for online applications, all t
y to e-mailed approval.

et, which leases small-ticket products such as copiers, PCs and other office machines, competes on decision turnaround
re. ECredit has allowed the company to go from 300 applications a day to 300 an hour -- with no increase in manpower.

redit, meanwhile, makes money from each transaction in the form of per-transaction evaluation fees. The company also
fits from companies which use the GFN, and it licenses its credit analysis tools to other businesses.

has targeted online business exchanges -- Internet 'malls' for certain business sectors, such as PlasticsNet.com, a site where
yers and sellers of plastic congregate to make deals.

redit recently entered an agreement with Moai.com, a provider of customised auctions and trading exchanges in a variety
ustries. Under terms of the agreement, the alliance will enable auction and trading exchange participants to utilise the
ancing options of the GFN in their bidding and purchasing decisions.

y reducing credit and financing transaction times from days to seconds, our customers achieve faster decisions and
proved approval rates which optimises the entire e-commerce transaction," said Arnold Waldstein, Moai.com vice-preside
business development.

redit could become one of the rags-to-riches stories that the Internet is famous for, according to Steven Kafka, an analyst
rrester who profiled the company in a recent report. "GFN will allow sellers to cherry-pick deals for their receivables
counts, by facilitating real-time credit decisions," he said.

rrester believes that to attain the massive economies of scale these e-marketplaces are working toward, they have to add
vices and multiple transaction mechanisms.

day, about half of e-marketplaces offer credit and payments services, links to distribution and logistics scheduling,
egration with ERP and financial data, and transaction settlement services.

ore than 80 percent of e-marketplaces plan to deploy all those services by 2001, according to Forrester.

ultiple payments mechanisms are embedded in the eCredit model -- the company recently agreed a deal with Cybersource
fer credit, financing and credit cards payments options through a single platform.

ok for eCredit to hit the EU soon. In December 1999, the company established European operations in suburban London.
ie company will seek to form strategic partnerships with European information content providers and consulting firms, as i
oks to extend its emerging business-to-business franchise across the continent.

ve have to spend some time localising the software for European companies and there are some differences between the wa
mpanies are evaluated for credit in Europe but we're essentially going to do the same thing there we have in the US,"
bertson said.

r the time being, the company enjoys first-to-market status in e-finance but competition is coming. Leading hi-tech equity
nds Capital Z Partners and General Atlantic Partners recently announced the creation of efinanceworks, a new independent
thouse for the formation, support and accelerated development of e-finance businesses worldwide. Efinanceworks will
ovide access to a combination of capital, industry expertise and business-development infrastructure.

he online financial services market has enormous potential and creates a tremendous opportunity for efinanceworks," said
ll Ford, a partner at General Atlantic. "As much as \$600 billion of the market value represented by today's US financial
vices companies may eventually be moved online. Efinanceworks will provide the industry expertise, capital, infrastru
usiness resources and strategic relationships required to successfully accelerate the development of e-finance companies,
om concept to marketplace."

major competitive advantage but we notice venture capitalists giving money to competing ideas all the time," he said.

"We're paying attention to the emerging competition but we have a product out there people are using. That's a significant advantage."

nonexistent three years ago, the Net-market-maker industry suddenly appears ripe for consolidation. Venture capital has poured into e-market start-ups, driving the number of business-to-business markets on the Internet from fewer than 20 to more than 300 in less than a year.

Many serve clearly defined vertical niches such as chemical manufacturing or steel; others purport to serve as the industry marketplace but compete with dozens of other business-to-business e-marketplaces in the industry.

One example of this is auto parts. Dozens of auto parts sites claim to be the standard for the industry -- the result is that none succeeds in driving the auto parts business online. In fact, General Motors has gone ahead with plans to create its own portal to automate procurement.

Robertson said that the premise for these e-marketplaces to be big money makers stems from the dynamics of hooking large suppliers and buyers into an online "community". Once connected, a company can communicate purchase orders and transaction and fulfillment information across the Internet, often replacing inefficient paper-based systems and thereby saving money.

Once a critical mass of buyers and sellers has been reached and transactions are flowing through its system, no other marketplace can compete for that vertical industry.

If that thesis is true, the first to conquer a vertical industry by providing significant value will own that market segment and has no intention of taking a percentage of every transaction that flows through it. "That's why we're glad we're first to market," Robertson said. "The difference is, every one of these vertical markets needs our product."

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